CLAIMS

We claim:

1. A method for forming a fuel cell electrode, the method comprising:

combining an electrically conductive material and a solid grindable resole resin binder, the binder being essentially free of nitrogen and nitrogen-containing compounds; and

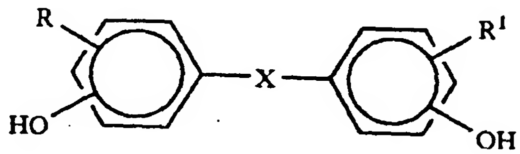
consolidating the electrically conductive material and the binder to form the electrode.

2. The method of claim 1 wherein:

the binder comprises the reaction product of a bisphenol and a molar excess of an aldehyde.

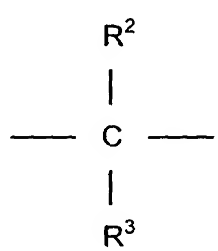
3. The method of claim 2 wherein:

the bisphenol comprises a material have the following formula I:



(I)

wherein R and R^1 are independently alkyl, aryl, arylalkyl or H, and X is a direct bond, sulfonyl, or alkylidene, wherein alkylidene is defined by the following Formula II:



(II)

wherein R^2 and R^3 are independently selected from H, alkyl, aryl, arylalkyl, halogenated alkyl, halogenated aryl and halogenated arylalkyl.

4. The method of claim 3 wherein:

the bisphenol is bisphenol A wherein R and R^1 are H, X is a alkylidene, and R^2 and R^3 are methyl.

5. The method of claim 2 wherein:

the aldehyde is formaldehyde.

6. The method of claim 1 wherein:

the binder has a glass transition temperature of 104°F or greater.

7. The method of claim 1 wherein:

the binder has a softening temperature between the range of 150°F and 180°F.

8. The method of claim 1 wherein:

the binder has a particle size between the range of about 25 to about 100 microns.

9. The method of claim 1 wherein:

the electrically conductive material is selected from crystalline carbon particles, amorphous carbon particles, and mixtures thereof.

10. The method of claim 1 wherein:

the electrically conductive material comprises graphite.

11. The method of claim 1 wherein:

the electrically conductive material and the binder are applied to a support structure before consolidating the electrically conductive material and the binder.

12. The method of claim 1 further comprising:

applying an electrocatalyst to the electrode after consolidating the electrically conductive material and the binder.

13. The method of claim 12 wherein:

the electrocatalyst is selected from platinum metal, palladium metal, rhodium metal, iridium metal, ruthenium metal, osmium metal, gold metal, platinum alloys, palladium alloys, rhodium alloys, iridium alloys, ruthenium alloys, osmium alloys, gold alloys, and mixtures thereof.

14. The method of claim 1 wherein the step of consolidating the electrically conductive material and the binder to form the electrode comprises:

heating the electrically conductive material and the solid grindable resole resin binder to a temperature above the softening temperature of the solid grindable resole resin binder.

15. The method of claim 14 wherein the step of consolidating the electrically conductive material and the binder to form the electrode further comprises:

applying pressure to the electrically conductive material and the solid grindable resole resin binder.

16. The method of claim 1 wherein the step of combining the electrically conductive material and the solid grindable resole resin binder comprises:

mixing the electrically conductive material and the solid grindable resole resin binder to form a mixture, and

shaping the mixture into a sheet.

17. The method of claim 1 wherein:

the resole resin binder comprises a single stage resin.

18. The method of claim 1 wherein:

the resole resin binder comprises the reaction product of a bisphenol, phenol, and a molar excess of an aldehyde in relation to the total moles of bisphenol and phenol.

19. A fuel cell comprising at least one fuel cell electrode formed by the method of claim 1.

20. A method for forming a fuel cell electrode, the method comprising:

combining an electrically conductive material and a solid grindable resole resin binder, the binder being essentially free of nitrogen and nitrogen-containing compounds; and

consolidating the electrically conductive material and the resole resin binder to form the electrode,

wherein the binder comprises the reaction product of a bisphenol and a molar excess of an aldehyde,

wherein the binder has a glass transition temperature of 104°F or greater,

wherein the binder has a softening temperature between the range of 150°F and 180°F, and

wherein the binder comprises a single stage resin.